

CLAIMS

1. Cable comprising a conductor and at least one
5 coating layer, characterized in that the said cable
comprises an inner layer comprising a self-repairing
material having a predetermined cohesiveness and a
controlled flowability.

2. Cable according to Claim 1, comprising an
10 insulating coating layer and an outer sheath and
characterized in that the inner layer is placed between
the insulating layer and the outer sheath.

3. Cable according to Claim 1, comprising an
insulating coating layer and characterized in that the
15 inner layer is placed between the conductor and the
insulating layer.

4. Cable according to Claim 1, comprising at least
two insulating coating layers and characterized in that
the inner layer is placed between two of the said
20 insulating layers.

5. Cable according to any one of the preceding
claims, in which the conductor is coated with a
semiconductive layer.

6. Cable according to any one of the preceding
25 claims, also comprising an expanded polymer coating.

7. Cable according to Claim 6, in which the
expanded polymer coating is placed in direct contact
with an outer protective sheath.

8. Cable according to any one of the preceding
30 claims, in which the inner layer has a thickness of not
less than 0.1 mm.

9. Cable according to Claim 8, in which the inner
layer has a thickness of between 0.2 and 2 mm.

10. Cable according to Claim 9, in which the
35 inner layer has a thickness of between 0.3 and 1 mm.

11. Cable according to any one of the preceding
claims, in which the self-repairing material is a
dielectric material.

12. Cable according to Claim 11, in which the self-repairing material has a dielectric rigidity under alternating current of greater than 15 kV/mm and a resistivity of greater than $10^{14} \Omega \cdot \text{cm}$.

5 13. Cable according to Claim 12, in which the self-repairing material has a dielectric rigidity under alternating current of greater than 20 kV/mm and a resistivity of greater than $10^{16} \Omega \cdot \text{cm}$.

10 14. Cable according to any one of the preceding claims, in which the self-repairing material has a cohesive force at room temperature of at least 0.05 kg/cm^2 .

15 15. Cable according to Claim 14, in which the self-repairing material has a cohesive force at room temperature of between 0.1 and 4 kg/cm^2 .

16. Cable according to Claim 15, in which the self-repairing material has a cohesive force at room temperature of between 0.2 and 2 kg/cm^2 .

20 17. Cable according to any one of Claims 14 to 16, in which the self-repairing material has a cohesiveness which is such that the force of recohesion measured at room temperature has a value of not less than 80% relative to the value of the cohesive force measured on the material as such.

25 18. Cable according to Claim 17, in which the force of recohesion measured at room temperature has a value of not less than 90% relative to the value of the cohesive force measured on the material as such.

30 19. Cable according to any one of the preceding claims, in which the self-repairing material has a controlled flowability which is such that a sample of about 3 grams of self-repairing material, placed on an aluminium plate inclined at 60° relative to the horizontal plane and maintained at 60°C for 24 hours,
35 shows a displacement of the material front along the inclined plate of between 0.5 and 400 mm .

20. Cable according to Claim 19, in which the displacement of the front of the self-repairing

material sample along the inclined plate is between 1 and 200 mm.

21. Cable according to Claim 20, in which the displacement of the front of the self-repairing material sample along the inclined plate is between 50 and 100 mm.

22. Cable according to any one of the preceding claims, in which the self-repairing material has a saturation water content of less than 400 ppm.

23. Cable according to Claim 22, in which the self-repairing material has a saturation water content of less than 200 ppm.

24. Cable according to any one of the preceding claims, in which the self-repairing material has a permeability to water vapour, measured at room temperature according to ASTM E96, of between 1.2×10^{-7} and 8.0×10^{-6} g/(cm·hour·mmHg).

25. Cable according to any one of the preceding claims, in which the self-repairing material comprises an amorphous polymer having properties of a high-viscosity liquid or of a semi-solid.

26. Cable according to Claim 25, in which the amorphous polymer is selected from:

(a) polyisobutene or isobutene copolymers with minor amounts of different C₄-C₁₂ α-olefins;

(b) atactic propylene homopolymers;

(c) silicone rubbers, consisting of linear chains of monomer units of formula -O-SiR₁R₂-, in which R₁ and R₂ are optionally substituted aliphatic or aromatic radicals.

27. Cable according to Claim 26, in which the amorphous polymer is polyisobutene having a viscosimetric (Staudinger) average molecular weight of between 2,000 and 50,000.

28. Cable according to Claim 27, in which the amorphous polymer is polyisobutene having a viscosimetric (Staudinger) average molecular weight of between 5,000 and 20,000.

29. Cable according to any one of Claims 25 to 28, in which the amorphous polymer is dissolved in a solvent.

5 30. Cable according to Claim 29, in which the solvent is a mineral oil or a synthetic oil.

31. Cable according to Claim 30, in which the solvent is a paraffinic oil or naphthenic oil.

10 32. Cable according to Claim 29, in which the amorphous polymer is dissolved in a solvent which is a low molecular weight homologue of the amorphous polymer.

15 33. Cable according to Claim 32, in which the amorphous polymer is a polyisobutene according to Claim 27 or 28, dissolved in a polybutenic oil having an osmometric average molecular weight of between 400 and 1,300.

20 34. Cable according to Claim 32, in which the amorphous polymer is a silicone rubber, dissolved in a silicone oil having a viscosity of between 100 and 5,000 mm²/sec at 25°C.

35. Cable according to any one of Claims 29 to 33, in which the amount of solvent is between 5 and 95% by weight, relative to the total weight of the mixture.

25 36. Cable according to Claim 35, in which the amount of solvent is between 50 and 90% by weight, relative to the total weight of the mixture.

37. Cable according to any one of Claims 29 to 36, in which the self-repairing material also comprises a thickener.

30 38. Cable according to Claim 37, in which the thickener is selected from: pyrogenic silica, bentonite or mixtures thereof.

35 39. Cable according to Claim 37 or 38, in which the thickener is added in amounts of between 1 to 20 parts by weight relative to the total weight of the mixture.

40. Cable according to any one of Claims 1 to 24, in which the self-repairing material comprises a solid polymeric material dispersed in an oily phase.

41. Cable according to Claim 40, in which the oily phase is selected from:

- (a) paraffinic or naphthenic oils;
- (b) polybutene oils having an osmometric average
5 molecular weight of between 400 and 1,300;
- (c) polypropylene oils
- (d) low molecular weight polyesters;
or mixtures thereof.

42. Cable according to any one of Claims 40 to
10 41, in which the solid polymeric material is a high molecular weight polymer with elastomeric properties selected from:

- (i) styrene block copolymers or terpolymers with different olefins and/or with dienes;
- 15 (ii) polyisobutene or copolymers of isobutene with minor amounts of different C₄-C₁₂ α -olefins;
- (iii) propylene copolymers with ethylene and/or with C₄-C₁₂ α -olefins or with C₄-C₂₀ dienes;
- (iv) polyisoprene or natural rubber;
- 20 (v) nitrile rubbers;
- (vi) butyl rubbers;
- (vii) amorphous ethylene copolymers;
or mixtures thereof.

43. Cable according to any one of Claims 40 to
25 42, in which the solid polymer material is dispersed in the oily phase in a subdivided form, in an amount of between 5 and 70% by weight relative to the total weight of the mixture.

44. Cable according to any one of Claims 25 to
30 43, in which the self-repairing material also comprises an inorganic filler.

45. Cable according to Claim 44, in which the inorganic filler is selected from: kaolin, calcium carbonate, aluminium hydroxide, magnesium hydroxide,
35 talc, precipitated silica, or mixtures thereof.

46. Cable according to Claim 44 or 45, in which the inorganic filler is present in amounts of between 5 and 50 parts by weight with respect to the total weight of the mixture.

47. Cable according to any one of Claims 25 to 46, in which the self-repairing material also comprises a tackifying agent.

5 48. Cable according to Claim 47, in which the tackifying agent is selected from: natural or synthetic rosins, or derivatives thereof; esterified polyalcohols; or mixtures thereof.

10 49. Cable according to Claim 47 or 48, in which the tackifying agent is present in amounts of between 1 and 20% by weight with respect to the total weight of the mixture.

15 50. Method for imparting to a cable comprising a conductor and at least one coating layer a capacity of self-repairing the coating layer, the said method comprising providing the cable with an inner layer comprising a material having the capacity, upon creation of a discontinuity in the coating layer, of re-establishing the continuity in the coating layer in a reversible manner.

20 51. Method according to Claim 50, in which the material of the inner layer is capable of at least partially filling the discontinuity without leaking from the cable in an uncontrolled manner.

25 52. Process for manufacturing a cable having a layer of self-repairing material, comprising the following steps:

(i) depositing the self-repairing material, maintained in a fluid state, on a cable core;

30 (ii) forming the said layer of self-repairing material so as to obtain a uniform layer of a predetermined thickness.

53. Process according to Claim 48, comprising the following steps:

35 - introducing an initial section of the cable core inside an application head through an inlet hole with a diameter which is slightly larger than the diameter of the cable core, and an outlet hole having a diameter which is predetermined according to the desired thickness of the layer of self-repairing material;

- feeding the application head with the self-repairing material maintained in a fluid state by pre-heating;

- passing the cable core through the application head so as to perform the deposition of the self-repairing material and the simultaneous forming of the layer of self-repairing material.
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54. Process for manufacturing a cable having a layer of self-repairing material, in which the self-repairing material is extruded onto the cable core.

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